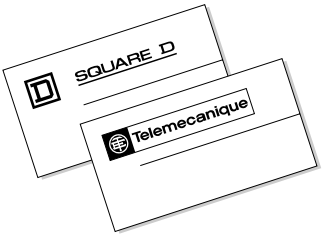
Altivar 66
Telemecanique

Guide d'exploitation
User's manual

variateurs de vitesse
pour moteurs asynchrones,
contrôle vectoriel de flux
avec capteur.

variable speed controllers
for asynchronous motors,
flux vector control with sensor.

2,2 / 220 kW, 400 V
3 / 350 HP, 460 V



GROUPE SCHNEIDER

Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

Variateurs de vitesse pour moteurs asynchrones, contrôle vectoriel de flux avec capteur **Page 2**

Variable speed controllers for asynchronous motors, flux vector control with sensor **Page 48**

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ATTENTION

When the speed controller power supply is switched on, the power units as well as a certain number of control components are connected to the AC supply. *Contact with these parts is extremely dangerous.*

After switching off the Altivar, *wait 1 minute before performing any operation inside the controller.* This period corresponds to the time for the discharge of the capacitors.

During operation the motor can be stopped by cancelling the run command or the speed reference, while the speed controller remains energized. If it is necessary to prevent restarting for personnel safety reasons, this electronic interlock is insufficient. *Provision must be made for the disconnection of the power circuit.*

NOTE

The speed controller includes safety devices which, in the event of a fault, can cause the stopping of the controller, and hence the motor. The motor itself can also be subject to stoppage by mechanical jamming. Finally, voltage fluctuations, and power supply failures in particular, can also cause the motor to stop.

The clearance of the fault causing the stoppage can initiate a restart involving a hazard for certain types of machines or installations, especially those which must conform to specific safety regulations.

It is therefore important that in such cases the user should take appropriate steps to prevent such restarting. For example by the use of an underspeed detector, causing the disconnection of the speed controller power supply in the event of a non-programmed motor stoppage.

Equipment design must conform to specifications set out in the IEC standards.

As a general rule, *the speed controller power supply must always be switched off* before performing any operation on either the electrical or the mechanical parts of the installation.

The company reserves the right to change the characteristics of its products and services at any time to incorporate the latest technological developments. The information contained in this document is therefore subject to change without notice and cannot be construed as containing any form of contractual obligation.

Warning

The Altivar 66 must be considered as a component. It is neither a machine nor a device ready for use in accordance with European standards (EN 60204-1 on the safety of machines, EN 50081 and 82 on electromagnetic compatibility). It is the responsiblity of the end user to ensure that his machine conforms to these standards.

This speed controllers must be installed and implemented in compliance with the international and national standards in force in the premises where it is to be used. Conformity is under the responsibility of the integrator who will comply with the EMC directive, among others, for what concerns the European Community.

Compliance with the essential requirements specified in the EMC directive is namely conditioned by application of the prescriptions provided in our catalogue which indicates the accessories to be associated with variators, for instance when radio disturbance filtering is needed.

For any information about these documents, please contact our SCHNEIDER commercial agency.

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Receipt

Check that the speed controller reference code printed on the label is that same as that on the delivery note corresponding to the purchase order.

Open the packaging and check that the Altivar 66 has not been damaged during transport.

Handling and storage

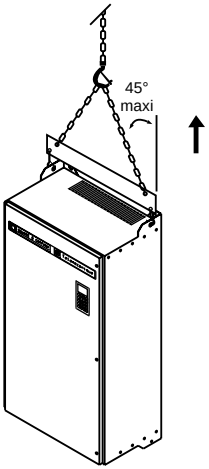
To ensure that the speed controller is protected prior to installation, handle and store it in its packaging.

Handling prior to installation

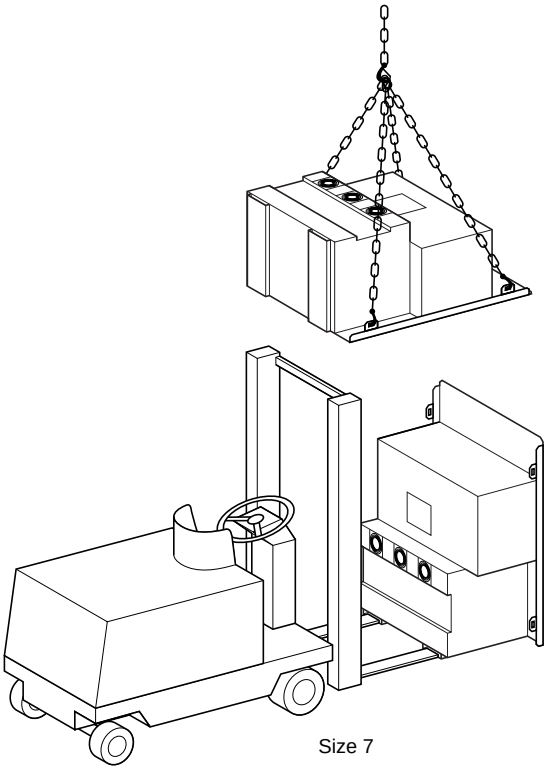
The Altivar 66 400-460 V range consists of 19 models divided into 7 sizes.

Sizes 1 to 4 can be removed from their packaging and installed manually.

From size 5 upwards, a hoist must be used.



Sizes 5 and 6



Size 7

Preliminary comments

Motor power rating

In the tables on pages 54 and 55, the values given are the standard power ratings.

At 460 V - 60 Hz, the HP ratings conform to NEC (National Electrical Code).

There is no HP equivalent on a 460 V supply for a motor rated at 3 kW on a 400 V AC supply, while the ATV-66U54N4 speed controller can be supplied at 460 V - 60 Hz.

Line current

The line current corresponds to the current consumed by the speed controller at nominal operating power on an AC supply with an impedance to limit the presumed short-circuit current to :

– 22000 A for a 400 V - 50 Hz supply voltage,
– 65000 A for a 460 V - 60 Hz supply voltage.

Providing the supply via a power transformer suitable for the speed controller, or adding a line choke from the catalogue, reduces current consumption to a value close to the speed controller nominal current.

Example : ATV-66FD23N4 with 15 kW motor on a 400 V AC supply.

Constant torque application : Inv = 33 A.

Line current with no choke : 45 A.
Line current with choke from catalogue : 28 A.

ATV-66FU41N4 speed controller

When a speed controller is used with a motor whose power rating is below 2.2 kW, the speed controller should be reconfigured via the graphic terminal to adapt its integral thermal protection (see the Programming Manual).

Motor-speed controller combination

Constant torque applications (switching frequency 4 kHz)

Supply voltage : 400 V ± 15 % and 460 V ± 15 %, 50 Hz ± 5 % or 60 Hz ± 5 %

Speed controller		Motor power rating		Line current	Controller nominal current (Inv)	Controller maximum transient current (60 s)	Total power dissipated at nominal load
Reference	Power	400 V 50 Hz	*460 V 60 Hz*				
	kVA	kW	*HP*	A	A	A	W
ATV-66FU41N4	4.1	0.75	–	4	2.3	3.2	100
(see preceding		–	*1*	*3.5*	*1.8*	*2.7*	*95*
page)		1.5	–	6.5	4.1	5.6	123
		–	*2*	*6*	*3.4*	*5.1*	*117*
		2.2	–	9	5.8	8	146
		–	*3*	*9*	*4.8*	*7.2*	*140*
ATV-66FU54N4	5.4	3	–	12	7.8	10.7	173
ATV-66FU72N4	7.2	4	–	15	10.5	14.3	209
		–	*5*	*13*	*7.6*	*11.4*	*195*
ATV-66FU90N4	9	5.5	–	20	13	17.7	251
		–	*7.5*	*18*	*11*	*16.5*	*225*
ATV-66FD12N4	12	7.5	–	26	17.6	24	317
		–	*10*	*24*	*14*	*21*	*290*
ATV-66FD16N4	16	11	–	35	24.2	33	447
		–	*15*	*34*	*21*	*31.5*	*380*
ATV-66FD23N4	23	15	–	45	33	45	580
		–	*20*	*44*	*27*	*40.5*	*530*
ATV-66FD33N4	33	22	–	60	48.4	66	754
		–	*30*	*59*	*40*	*60*	*655*
ATV-66FD46N4	46	30	–	78	66	90	1060
		–	*40*	*75*	*52*	*78*	*880*

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Motor-speed controller combination

Constant torque applications (switching frequency 2 kHz)

Supply voltage : 400 V ± 15 % and 460 V ± 15 %, 50 Hz ± 5 % or 60 Hz ± 5 %

Speed controller		Motor power rating		Line current	Controller nominal current (Inv)	Controller maximum transient current (60 s)	Total power dissipated at nominal load
Reference	Power	400 V 50 Hz	*460 V 60 Hz*				
	kVA	kW	*HP*	A	A	A	W
ATV-66FD54N4	54	37	–	94	79.2	108	1159
		–	*50*	*92*	*65*	*97.5*	*885*
ATV-66FD64N4	64	45	–	110	93.5	127.5	1374
		–	*60*	*105*	*77*	*115.5*	*1055*
ATV-66FD79N4	79	55	–	130	115.5	157.5	1610
		–	*75*	*128*	*96*	*144*	*1270*
ATV-66FC10N4	100	75	–	171	151.8	207	2175
		–	*100*	*173*	*124*	*186*	*1605*
ATV-66FC13N4	130	90	–	198	190	258	2525
		–	*125*	*211*	*156*	*234*	*1955*
ATV-66FC15N4	150	110	–	237	226	307.5	3000
		–	*150*	*246*	*180*	*270*	*2255*
ATV-66FC19N4	190	132	–	275	270	367.5	3500
		–	*200*	*314*	*240*	*360*	*3070*
ATV-66FC23N4	230	160	–	326	330	450	4485
		–	*250*	*379*	*300*	*450*	*4485*
ATV-66FC28N4	280	200	–	399	407	555	5250
		–	*300*	*441*	*360*	*540*	*5250*
ATV-66FC31N4	310	220	–	421	448.8	612	5970
		–	*350*	*506*	*420*	*630*	*5970*

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Encoder interface board

The Altivar 66 is fitted with an encoder interface board VW3-A66203 with RS 422 encoder feedback and 5 Vdc power supply.

The encoder interface board has :

- 3 logic inputs,
- 1 differential analog input,
- 1 analog current input,
- 2 open-collectors logic outputs,
- 1 analog output.

At the top of the encoder interface board, there is a PCMCIA slot for a board which interconnects the controller to field bus, such as UNITELWAY, FIPIO, Interbus S, Modbus Plus.

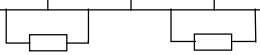
Protection IP 20.
All the data related to the environment are the same as those of the Altivar 66.

Remark : The absence of the encoder interface board results in an "encoder card" fault.

Encoder type

This is incremental optical encoder with 5 V differential inputs,compatible with the RS 422 standard.The number of points per revolution should be between 90 and 5000.
Our proposal is 1024 (factory presetting).

Terminal	1	2	3	4	5	6	7	8	9
Signal	A +	A -	B +	B -	+ Vcc			Gnd	NC



It is indispensable to adapt the line by connecting resistors, such as those shown below, in the differential channels as close as possible to the speed controller. The value of these resistors must be between 100 and 150 Ohms (typically 120 Ohms).
In cases where the speed controller is installed coupled to an axis control module, it is unnecessary to fit resistors as the axis module is normally of low impedance (90 to 370 Ohms).
The encoder and line resistors must not consume more than 225 mA.

Cable type

Use a cable containing screened twisted pairs.
Convey both complementary signals through the same screened conductor pair :
A +, A -
B +, B -
Vcc, Gnd

Screening should be electrically continuous from the motor to the controller.
Ensure electrical continuity when assembling the connector both motor and controller.
In case of a long length of cable (between 50 and 200 m), the size of wires on the encoder output must be 2.5 mm^2 ; beyond 200 m add an independant power supply.

Continuous operation

For naturally ventilated motors, motor cooling is linked to speed. This leads to derating for speeds which are below half the nominal speed.

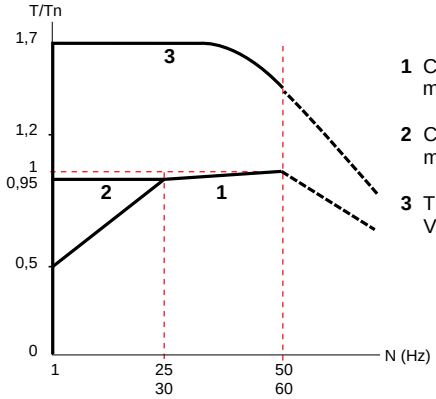
Transient operation

The overtorque depends on the maximum transient current which the speed controller can supply.
On starting : up to 2 In for 0.2 s

Overspeed operation

The voltage can no longer develop in line with the frequency, leading to a decrease in motor induction which results in a loss of torque. Check with the manufacturer that the motor can operate at overspeed.

Constant torque applications : **torque characteristics**



1 Continuous useful torque : naturally ventilated motor

2 Continuous useful torque : force-ventilated motor

3 Transient overtorque : typical curve at ± 10 %
Value : 1.7 Tn for 60 s

Note : the nominal frequency and the maximum frequency can be adjusted using the terminal, both in open loop and close loop :
• from 25 to 200 Hz for ATV-66FU41N4 to FC31N4 controllers.

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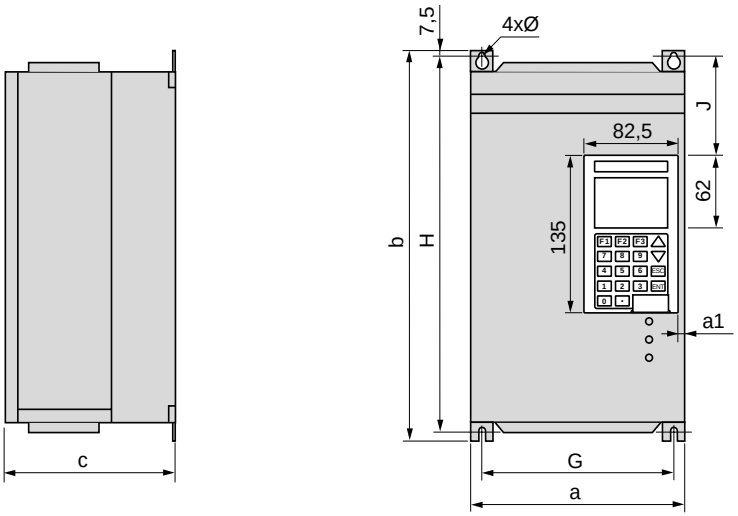
Characteristics

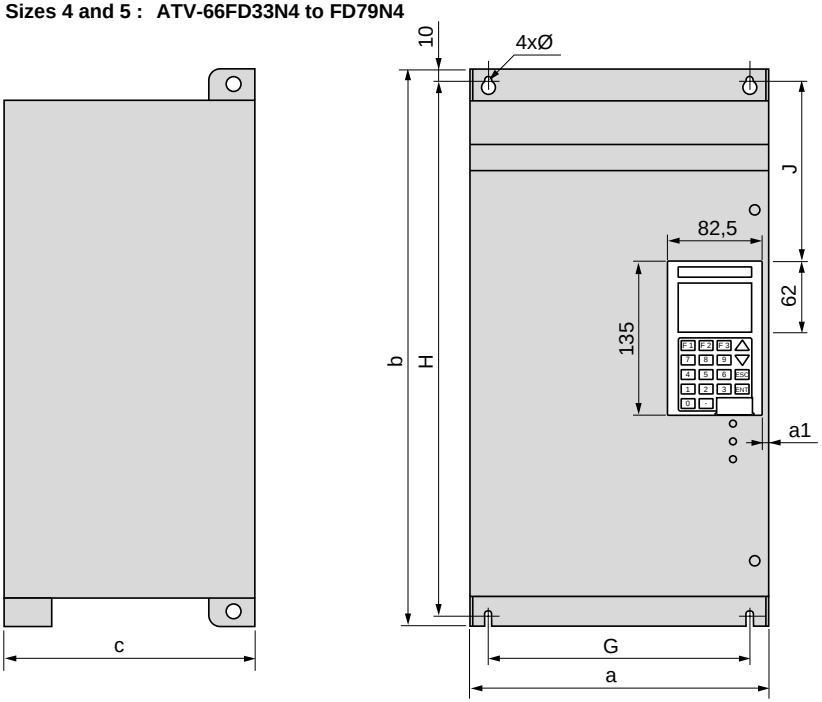
Output voltage	Maximum voltage equal to that of AC supply voltage
Frequency range	0.1 to 50/60 Hz Extension possible : – up to 200 Hz
Frequency resolution	0.05 Hz with analog reference signal at 50 Hz (10 bits) 0.015 Hz with digital reference signal at 50 Hz (12 bits + sign)
Speed control accuracy	0.01 % if HSP = LSP or by the line 0.2 % of analog input set-point
Acceleration and deceleration ramps	Individually adjustable from 0.1 to 999.9 s (resolution 0.1 s) Automatic adaptation of the ramp times in the event of the torque capacity being exceeded
Main protective and safety devices of the speed controller	Protection against short-circuits : – between output phases – between output phases and earth (ground) – on internal supply outputs – on logic and analog outputs Thermal protection against overheating AC supply overvoltage and undervoltage protection Protection in the event of an AC supply phase fault
Motor protection	Integrated electronic thermal protection (calculation of I^2t taking frequency into account) Memorization of motor thermal state Protection against phase faults
Degree of protection	IP 30 – NEMA type 1 cover closed, IP 20 cover open : controllers ATV-66FU41N4 to 66FD79N4 IP 30 - NEMA type 1 cover closed, IP 00 cover open : controllers ATV-66FC10N4 to 66FC19N4 IP00 - controllers ATV-66FC23N4 to 66FC31N4
Ambient air temperature	Operation : 0 °C to + 40 °C ATV-66FU41N4 to FD79N4 : operation possible up to + 60 °C with ventilation kit and current derating of 2,2% per °C between + 40 °C and + 60 °C Storage : - 25 °C to + 70 °C

Maximum operating altitude	1000 m without derating (above this, derate the current by 1 % for each additional 100 m)
Maximum relative humidity	93 % without condensation or dripping water, conforming to IEC 68-2-3
Degree of pollution	Degree 3 conforming to IEC 664-1
Vibration resistance	Conforming to IEC 68-2-6 : – 1,5 mm peak to peak from 3 to 13 Hz– 1mm from 13 to 22.3 Hz and 2 gn from 22.3 to 150 Hz : ATV-66FU41N4 to 66FD12N4 – 1.5 mm peak to peak from 3 to 13 Hz and 1 gn from 13 to 150 Hz : ATV-66FD16N4 to 66FD79N4 speed controllers – 0.15 mm from 10 to 58 Hz and 1 gn from 58 to 150 Hz : ATV-66FC10N4 to ATV-66FC19N4
Shock resistance	Conforming to IEC 68-2-27 : 15 g, 11 ms

Sizes 1 to 3 : ATV-66FU41N4 to FD23N4

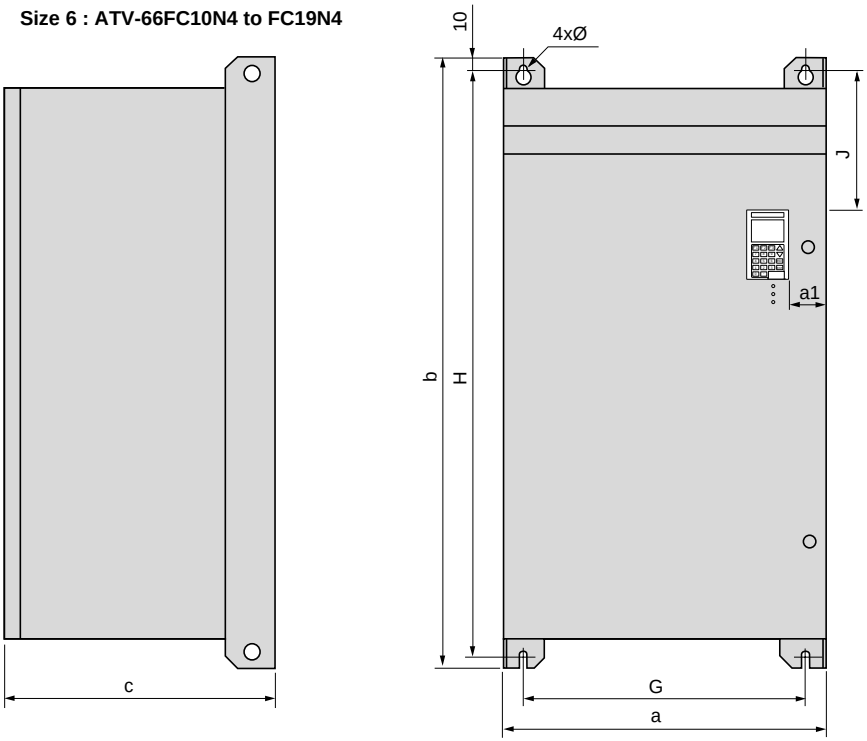


Sizes 4 and 5 : ATV-66FD33N4 to FD79N4



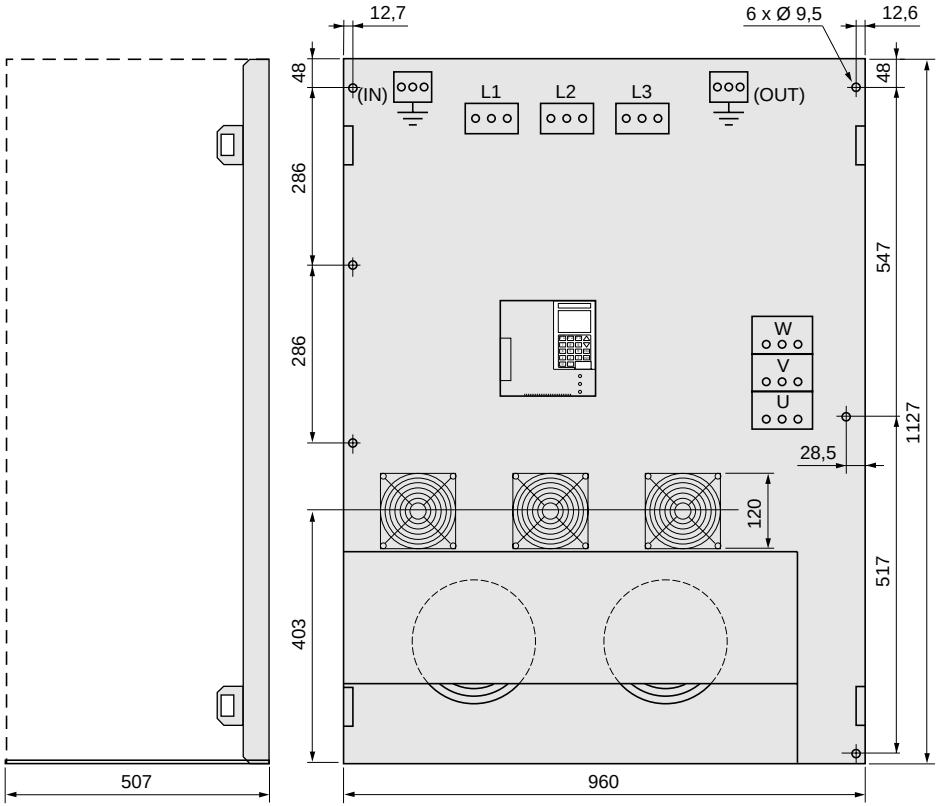
Dimensions

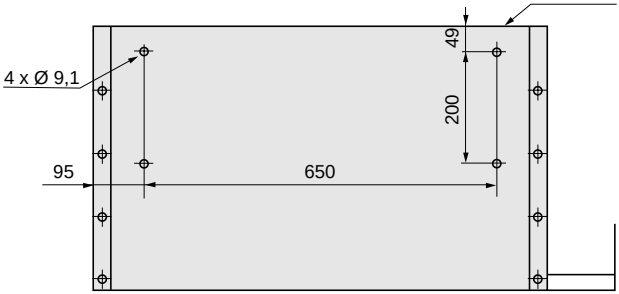
Size 6 : ATV-66FC10N4 to FC19N4



Size	Altivar reference	a mm	b mm	c mm	G mm	H mm	J mm	Ø mm	a1 mm	Weight kg
1	**ATV-66FU41N4** **ATV-66FU54N4** **ATV-66FU72N4**	200	295	165	175	280	35.4	5.5	6	4.7
2	**ATV-66FU90N4** **ATV-66FD12N4**	234	325	195	209	310	44.3	5.5	6	7.3
3	**ATV-66FD16N4** **ATV-66FD23N4**	234	415	245	209	400	79	5.5	6	14
4	**ATV-66FD33N4** **ATV-66FD46N4**	240	600	280	205	580	116.4	7	12	27
5	**ATV-66FD54N4** **ATV-66FD64N4** **ATV-66FD79N4**	350	650	300	300	620	121.4	9	12	40 41 41
6	**ATV-66FC10N4** **ATV-66FC13N4** **ATV-66FC15N4** **ATV-66FC19N4**	585	980	370	525	960	205	11	70	127 136 136 136

Size 7 : ATV-66FC23N4 to FC31N4





Bottom view

Weight : 255 kg

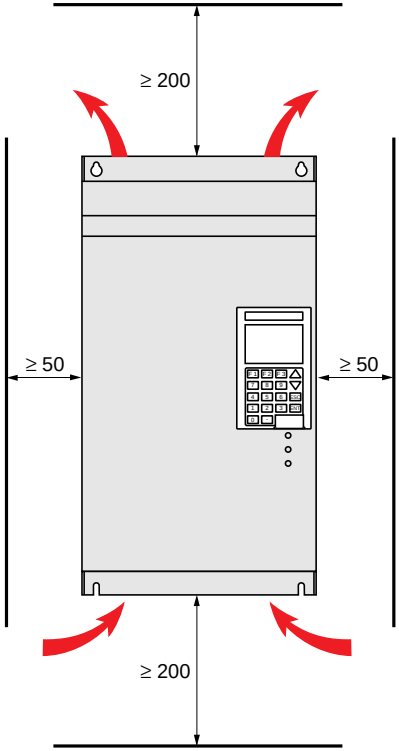
Mounting recommendations (sizes 1 to 5)

Install the device vertically.

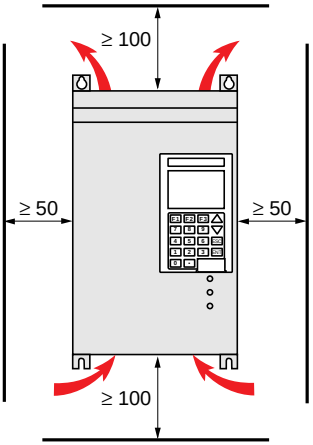
Do not place it close to heating elements.

Leave sufficient clearance to allow circulation of air necessary for cooling. Ventilation is from the bottom to the top of the device.

Sizes 4 and 5



Sizes 1 to 3



Ventilating fan flow rates

ATV-66FU41N4 and FU54N4 (size 1)	: 5 dm³/s
ATV-66FU72N4 (size 1)	: 10 dm³/s
ATV-66FU90N4 and FD12N4 (size 2)	: 22 dm³/s
ATV-66FD16N4 and FD23N4 (size 3)	: 47 dm³/s
ATV-66FD33N4 to FD79N4 (sizes 4 and 5)	: 100 dm³/s

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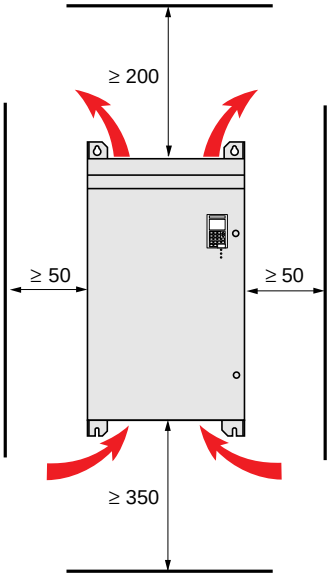
Mounting recommendations (sizes 6 and 7)

Install the device vertically.

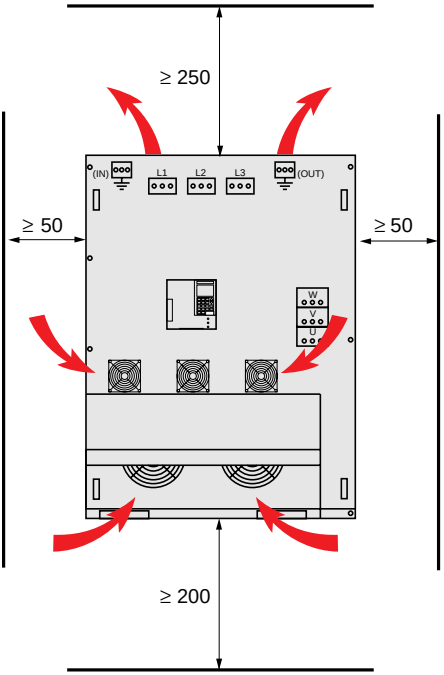
Do not place it close to heating elements.

Maintain enough clearance for the cooling air flow that a fan provides from bottom to top for Size 6 unit and from the bottom of the front panel to the top for Size 7 unit.

Sizes 6



Sizes 7



Ventilating fan flow rates

ATV-66FC10N4 to FC19N4 (size 6) : 250 dm^3/s
ATV-66FC23N4 to FC31N4 (size 7) : 470 dm^3/s

Recommendation for installing a Size 7 unit in a cabinet : A clearance greater than 250 mm should be provided between the VSC and the cabinet walls for easier routing of cables and easier access to the unit.

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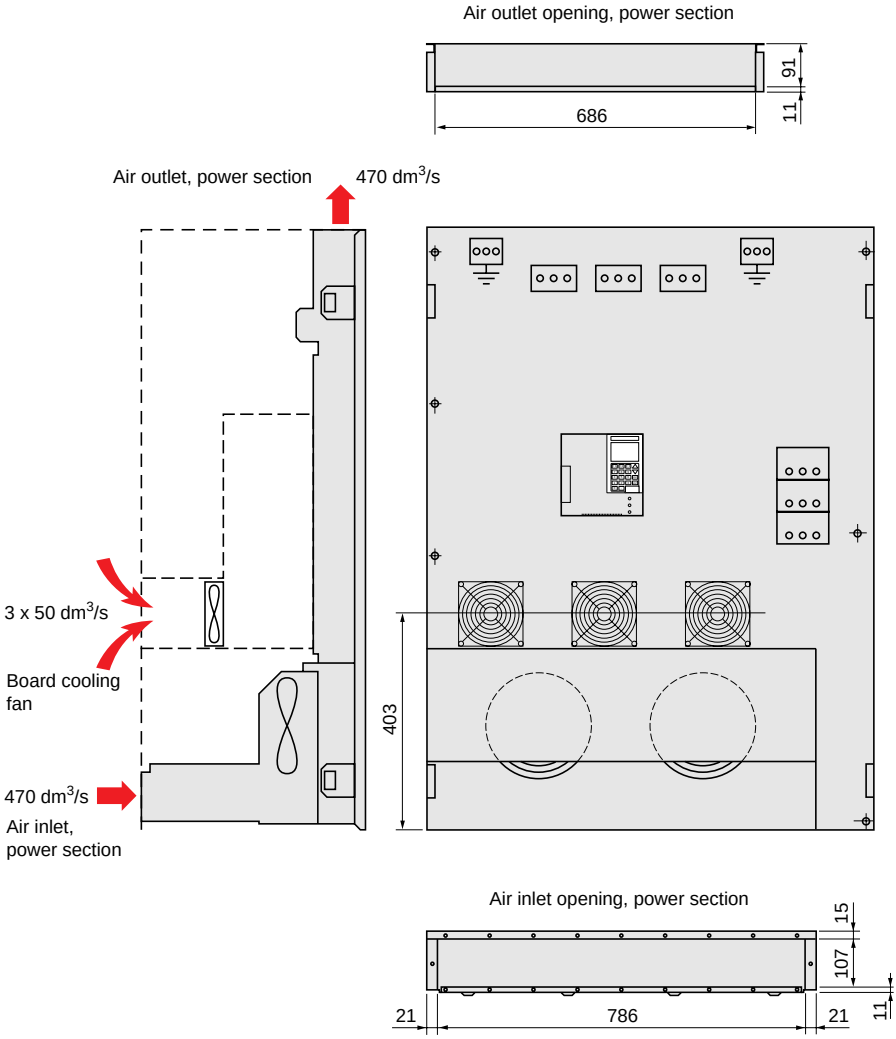
Mounting recommendations (size 7)

Principle of forced-air cooling in IP 00



Recommendation : Hot air must be exhausted to the outside.

The IP00 version of the Altivar 66 Size 7 unit must be equipped with a protective barrier to ensure personnel safety against electric shocks.

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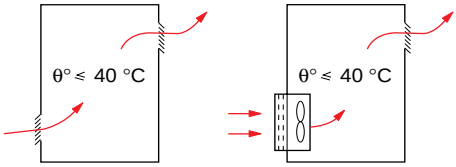
Metal enclosure, degree of protection IP 23 or IP 54

Observe the mounting recommendations given on pages 63 to 65.

To ensure adequate air circulation inside the speed controller :
– provide ventilation louvres,
– check that the ventilation is adequate. If not fit a forced ventilation unit with a filter,
–use special filters at IP 54.



Dust and damp proof metal enclosure (degree of protection IP 54)

Under certain environmental conditions the speed controller must be mounted in a dust and damp proof enclosure : dust, corrosive gas, high humidity with a risk of condensation or dripping water, splashing liquid, etc.

Observe the mounting recommendations given on pages 63 to 65.

To avoid hot spots in the speed controller, add a ventilation kit to circulate the air inside the device.

This arrangement makes it possible to use the speed controller in an enclosure whose maximum internal temperature can reach 60 °C.

Warning

In this case, derate the speed controller nominal current by 2.2 % for each °C above 40 °C.

Ventilation kit references : **VW3-A66821** for ATV-66FU41N4 to FU72N4 (size 1)
VW3-A66822 for ATV-66FU90N4 to FD23N4 (sizes 2 and 3)
VW3-A66824 for ATV-66FD33N4 to FD46N4 (size 4)
VW3-A66825 for ATV-66FD54N4 to FD79N4 (size 5)

Calculating the size of the enclosure

Maximum thermal resistance Rth (°C/W) :

$$Rth = \frac{\theta° - \theta°e}{P}$$

θ° = maximum temperature in the enclosure in °C,
θ°e = maximum external temperature in °C,
P = total power dissipated in the enclosure in W.

Power dissipated by the speed controller : see pages 54 and 55.
Add the power dissipated by the other component parts of the device.

Useful heat exchange surface of the enclosure S (m^2) :
(sides + upper surface + front panel, when wall mounted)

$$S = \frac{K}{Rth}$$

K = thermal resistance per m^2 of enclosure.

For a metal enclosure : K = 0.12 with internal fan,
K = 0.15 with no fan.

Warning : do not use insulated enclosures, as they have a poor level of conductivity.

Flush mounting (sizes 1 to 3)

To reduce the power dissipated in the enclosure, the speed controller can be flush mounted, with the heatsink on the outside. This necessitates making a cut-out in the rear of the enclosure and using a mounting kit which comprises : dust and damp proof gaskets, leaflet and a cut-out drawing.

IP 54 kit references :
VW3-A66801 for ATV-66FU41N4 to FU72N4 (size 1)
VW3-A66802 for ATV-66FU90N4 and FD12N4 (size 2)
VW3-A66803 for ATV-66FD16N4 and FD23N4 (size 3)

Mounting as an air heat exchanger with the exterior (sizes 1 to 5)

To reduce the power dissipated in the enclosure, the speed controller can be fitted with adaptors which enable the ventilation fan to draw in cool air at the bottom of the controller and evacuate hot air at the top.

This necessitates making a two cut-outs in the rear of the enclosure and using a mounting kit which comprises : adaptors, dust and damp proof gaskets, leaflet and a cut-out drawing.

Kit references :
VW3-A66811 for ATV-66FU41N4 to FU72N4 (size 1)
VW3-A66812 for ATV-66FU90N4 and FD12N4 (size 2)
VW3-A66813 for ATV-66FD16N4 and FD23N4 (size 3)
VW3-A66814 for ATV-66FD33N4 and FD46N4 (size 4)
VW3-A66814 for ATV-66FD54N4 to FD79N4 (size 5)

With each of these mounting methods, the maximum internal temperature in the enclosure can reach 60 °C without having to derate the speed controller current. To avoid hot spots, use the ventilation kit to circulate the air inside the speed controller.

Note : with each of these mounting methods, the heatsink and ventilation fan outside the enclosure remains protected to IP 30.

Power dissipated by the speed controller in the enclosure using one of the mounting methods			
Altivar reference	Power in W	Altivar reference	Power in W
ATV-66FU41N4	70	**ATV-66FD23N4**	130
ATV-66FU54N4	70	**ATV-66FD33N4**	130
ATV-66FU72N4	70	**ATV-66FD46N4**	145
ATV-66FU90N4	75	**ATV-66FD54N4**	198
ATV-66FD12N4	75	**ATV-66FD64N4**	200
ATV-66FD16N4	110	**ATV-66FD79N4**	210

Possibility of condensation

If the device is left switched off for long periods, a heating system must be provided (0.2 to 0.5 W per 10 cm^2 of the enclosure) which switches on automatically as soon as the device stops.
This device keeps the inside of the enclosure at a temperature slightly above the external temperature, and avoids any risk of condensation or dripping water while the device is switched off.

Alternative solution : keep the device powered up when it is stopped (the heat of the device itself when it is powered up is generally sufficient to provide this difference in temperature).

Access to terminal blocks (sizes 1 to 5)

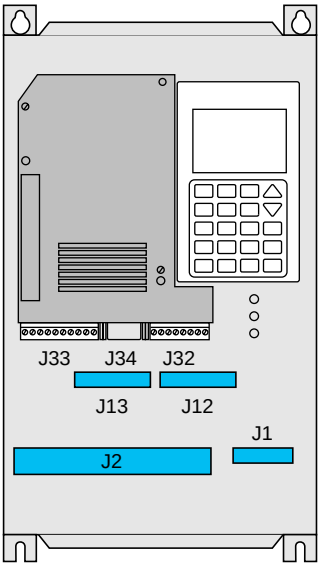
The protective cover is attached to the front panel of the Altivar in the following way :

– Sizes 1 to 3 : clip-on attachment,
– Sizes 4 and 5 : using 2 captive screws.

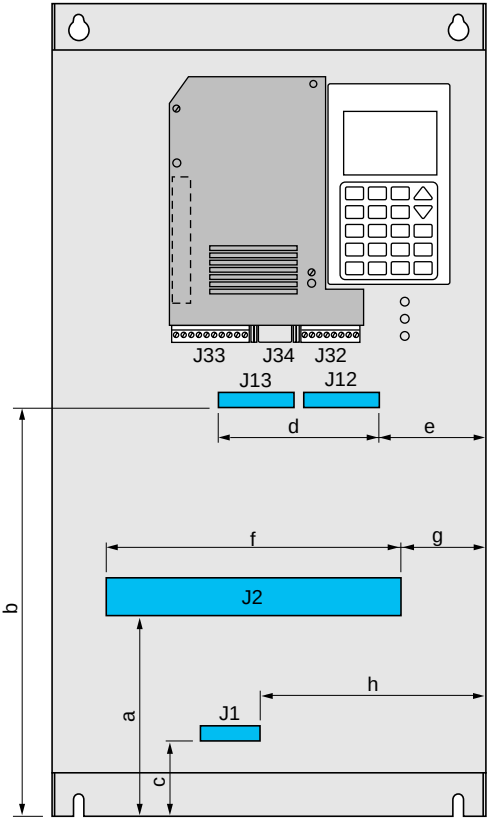
To access the terminal blocks, detach the cover and pivot it from right to left.

Location of the terminal blocks

Sizes 1 to 3



Sizes 4 and 5



	a mm	b mm	c mm	d mm	e mm	f mm	g mm	h mm
S4	110	300	80	100	60	180	40	180
S5	200	320	90	100	60	220	60	170

The connection cables enter through the base of the Altivar (see page 85 and 86) :

– sizes 1 to 3 : via holes which are fitted with cable glands in the insulating plate (attached with 2 screws), or via the opening created by the removal of this plate.

– sizes 4 and 5 : via holes which are fitted with cable glands in the metal plate or via the opening created by the removal of this plate.

When the plate is removed the degree of protection of the speed controller becomes IP 20.

Terminal blocks

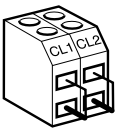
J13 : control card analog I/O.
J12 : control card logic I/O.
J1 : relay logic outputs.
J2 : power terminal block.

J2 terminals	Function	Maximum connection capacity *Terminaltightening torque*				
		Size 1	Size 2	Size 3	Size 4	Size 5
⏚	Earth (ground) terminal connected to Altivar earth	6 mm² *1,96 Nm*	6 mm² *1,96 Nm*	10 mm² *2,5 Nm*	35 mm² *4Nm*	70 mm² *10 Nm*
CL1 CL2	Control and ventilation power supply	2.5 mm² *0,76 Nm*	2.5 mm² *0,76 Nm*	2.5 mm² *0,76 Nm*	2.5 mm² *0,76 Nm*	2.5 mm² *0,76 Nm*
L1 L2 L3	Power supply	2.5 mm² *0,76 Nm*	6 mm² *1,96 Nm*	10 mm² *2,5 Nm*	35 mm² *4 Nm*	70 mm² *10 Nm*
+ –	DC bus connection	2.5 mm² *0,76 Nm*	6 mm² *1,96 Nm*	10 mm² *2,5 Nm*	35 mm² *4 Nm*	70 mm² *10 Nm*
PA PB	Connection to the braking resistor	2.5 mm² *0,76 Nm*	6mm² *1,96 Nm*	6 mm² *1,96 Nm*	16 mm² *3 Nm*	35 mm² *4 Nm*
U/T1 V/T2 W/T3	Connection to the motor	2.5 mm² *0,76 Nm*	6 mm² *1,96 Nm*	10 mm² *2,5 Nm*	35 mm² *4 Nm*	70 mm² *10 Nm*
⏚	Earth (ground) terminal connected to Altivar earth	6 mm² *1,96 Nm*	6 mm² *1,96 Nm*	10 mm² *2,5 Nm*	35 mm² *4 Nm*	70 mm² *10 Nm*

The Altivar is delivered in a configuration to ensure control of power by a circuit-breaker.
Terminals CL1-CL2 are connected to power supply L1-L2 via a strap.
Should the control power supply CL1-CL2 be supplied separately from the load power supply, it is then better to remove the tow straps so as to facilitate connection at terminals CL1-CL2 (see below).

– ATV-66FU41N4 to FD12N4 : Remove the straps between (CL1, CL2) and (L1, L2)

– ATV-66FD16N4 to FD79N4 : Remove the straps at terminals CL1-CL2.
Unscrew the top section and then pull out the strap, leaving the bottom section simply plugged in.



Remark : For the ratings ATV-66FD33N4 to FD79N4, the control power supply must always be present before the load power supply (where this is separate). **The variator must not be in the following configuration : load power supply present, control power supply absent.**

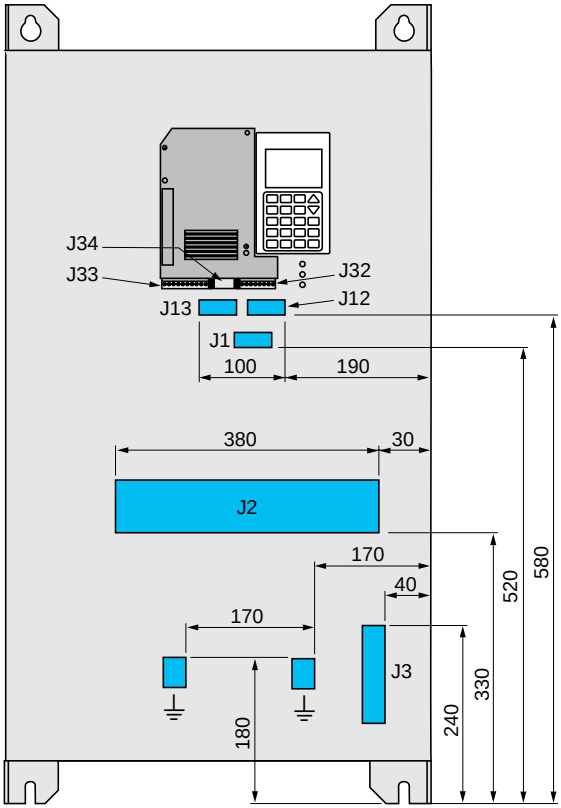
Note : if the load and control power supplies come from two separate networks with a common ground, make sure that the phases match between L1 and CL1, and between L2 and CL2.

Access to terminal blocks (size 6)

For size 6 Altivars, the metal protective cover on the front panel supports the graphic terminal and the 3 LED indicators. It is attached via two captive screws.

To access the terminal blocks, unscrew the cover and pivot it from right to left. Before doing this, read the instructions on the label on the right hand side of the speed controller.

Location of terminal blocks



The connection cables enter through the base of the Altivar via holes which are fitted with cable glands in the metal plate or via the opening created by the removal of this plate.

Inside the speed controller, there is a vertical insulating conduit on the right hand side to carry the control and signalling circuit wires.

When the plate is removed the degree of protection of the speed controller becomes IP 00.

ENGLISH

Power terminal blocks (size 6)

Terminal blocks

J13 : control card analog I/O.
J12 : control card logic I/O.
J1 : relay logic outputs.
J2 and J3 : power terminal blocks.

J2 - terminals	Function	Maximum connection capacity *Terminaltightening torque*	
		ATV-66FC10N4 and FC13N4	**ATV-66FC15N4 and FC19N4**
L1 L2 L3	Power supply	120 mm^2 *36,7 Nm*	185 mm^2 *36,7 Nm*
+ –	DC bus connection	120 mm^2 *36,7 Nm*	185 mm^2 *36,7 Nm*
U/T1 V/T2 W/T3	Connection to the motor	120 mm^2 *36,7 Nm*	185 mm^2 *36,7 Nm*
J3 - terminals			
PA PB	Connection to the braking resistor	50 mm^2 *5,6 Nm*	50 mm^2 *5,6 Nm*
CL1 CL2	Control and ventilation power supply	4 mm^2 *2,3 Nm*	4 mm^2 *2,3 Nm*
CL21 CL22	Terminals power supply/control	4 mm^2 *2,3 Nm*	4 mm^2 *2,3 Nm*
⏚	Earth (ground) terminals connected to Altivar earth	70 mm^2 *10 Nm*	95 mm^2 *10 Nm*

The Altivar is delivered in a configuration to ensure control of power by a circuit-breaker.
Terminals CL1-CL2 are connected to power supply L1-L2 via a strap.
Should the control power supply CL1-CL2 be supplied separately from the load power supply, it is then better to remove the tow straps so as to facilitate connection at terminals CL1-CL2.

– ATV-66FC10N4 to FC19N4 : Remove the straps between (CL1, CL2) and (CL21, CL22)

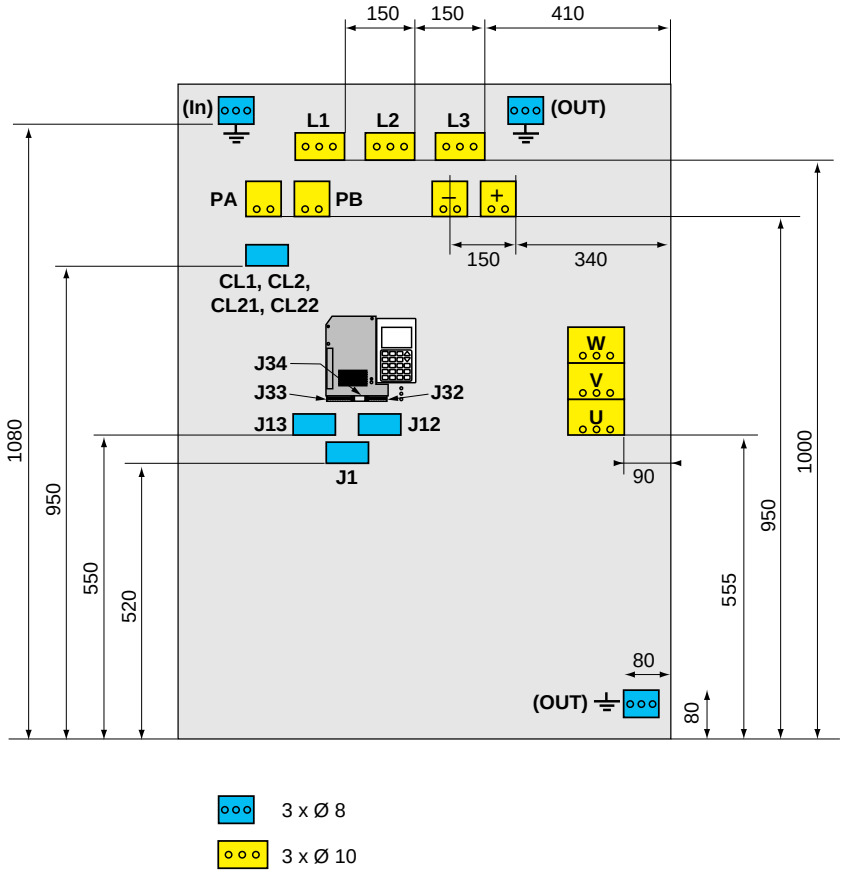
Remark : For the ratings ATV-66FC10N4 to FC19N4, the control power supply must always be present before the load power supply (where this is separate).
The variator must not be in the following configuration : load power supply present, control power supply absent.

Note : if the load and control power supplies come from two separate networks with a common ground, make sure that the phases match between L1 and CL1, and between L2 and CL2.

Access to terminal blocks (size 7)

The size 7 Altivars have no metal protecting cover on the front face (variator protection class IP 00).
The terminal and the 3 indicator LEDs are installed on the insulating ranck of the control card.

Location of terminal blocks



Terminal blocks

J13 : control card analog I/O.
J12 : control card logic I/O.
J1 : relay logic outputs.

J2 - terminals	Function	Maximum connection capacity *Terminaltightening torque* **ATV-66FC23N4 to FC31N4**
L1 L2 L3	Power supply	3 x 240 mm² *36,5 Nm*
+ –	DC bus connection	2 x 240 mm² *36,5 Nm*
U/T1 V/T2 W/T3	Connection to the motor	3 x 240 mm² *36,5 Nm*
CL1 CL2	Control and ventilation power supply	4 mm² *2,3 Nm*
PA PB	Connection to the braking resistor	2 x 240 mm² *36,5 Nm*
CL21 CL22	Terminals for common load/control power supply	4 mm² *2,3 Nm*
⏚	Earth (ground) terminals connected to Altivar earth	3 x 185 mm² *18,5 Nm*

The Altivar is delivered in a configuration to ensure control of power by a circuit-breaker.
Terminals CL1-CL2 are connected to power supply L1-L2 via a strap.
Should the control power supply CL1-CL2 be supplied separately from the load power supply, it is then better to remove the tow straps so as to facilitate connection at terminals CL1-CL2 (see below).

– ATV-66FC23N4 to FC31N4 : Remove the straps between (CL1, CL2) and (CL21, CL22)

Remark : For the gauges ATV-66FC23N4 to FC31N4, the control power supply must always be present before the load power supply (where this is separate). The variator must not be in the following configuration : load power supply present, control power supply absent.

Note : if the load and control power supplies come from two separate networks with a common ground, make sure that the phases match between L1 and CL1, and between L2 and CL2.

Terminal blocks J13, J12 and J1 have plug-in connectors with a coding chip.
Maximum connection capacity : 2.5 mm^2.

Factory configuration of the speed controller

J13-J12 terminals	Function	Characteristics
S	Connection of screening to reference circuits	Earth (ground) terminal connected to Altivar earth
	Terminal not connected	
COM	Analog input common	0 V
AI1	Voltage speed reference	Analog input 0-10 V, impedance 30 kΩ
+10	Supply to speed reference potentiometer R	+ 10 V isolated and regulated, maximum 10 mA, recommended value of R between 1 kΩ and 10 kΩ
AI2	Current speed reference	Analog input 4-20 mA, impedance 250 Ω
AO1 AO2	Output frequency Output current	2 analog outputs 0-20 mA, maximum recommended load impedance 500 Ω
COM	Analog output common	0 V
LI1 LI2 LI3 LI4	Unlock speed controller Forward operation command Reverse operation command Step by step operation (JOG)	4 logic inputs, impedance 3.5 kΩ, supply + 24 V (min 11 V, max 30 V), state 0 if < 5 V, state 1 if ≥ 11 V
+24	Supply to logic inputs	+ 24 V isolated and not regulated (min 20 V, max 30 V), maximum 200 mA
LOP	Supply to logic outputs	Connect to + 24 V of internal supply or of an external supply
LO1 LO2	Speed reached Current limit reached	2 PLC compatible logic outputs (open collector), + 24 V (max 32 V), max 20 mA with internal supply or 200 mA with external supply
COM	Logic output common	0 V
J1 terminals		
R1A R1B R1C	C/O contact on relay R1 : activated on power up, de-activated at a fault	Switching capacity of contacts : min 10 mA for 24 V DC, max for inductive load (cos φ = 0.4 and L/R = 7 ms) : 1.5 A for 250 V AC or 2.5 A for 30 V DC
R2A R2B R2C	C/O contact on relay R2 : not assigned	

Encoder interface card VW3-A66203

Terminal blocks J32 and J33 are provided with plug-in type connectors.
Maximum connection capacity : 2.5 sq. MM with or without end-piece.
Terminal block J34 is a SUB-D-9-way socket connector for coder feedback.

Ex-works controller configuration

J33 Terminal	Function	Specifications
S	Set-point circuit screen connection de l'Altivar	Earthing connector connected to Altivar ground
	Non-connected terminal	
COM	Analog I/O common	0 V
AI3A	Speed set-point	± 10 V differential input, 30 kohm impedance
AI3B		
+10	Analog input power supply	Maximum current flow : 10 mA
-10	Analog input power supply	Maximum current flow : 10 mA
AI4	Non-configured current analog input	0-20 mA, 4-20 mA, 20-4 mA, 4-12-20 mA 250 ohm impedance
AO3	Motor torque	0/4-20 mA, 4-12-20 mA 500 ohm maximum impedance
COM	Analog I/O common	0 V

Remark : AI1 / AI2 / AI3 inputs are summing inputs.

J34 Terminal		Function	Specifications
+5V	5	Coder power supply	Maximum current flow : 225 mA
B-	4	Incremental chanel B	Maximum frequency : ≤ 240 kHz per chanel
B+	3		
A-	2	Incremental chanel A	
A+	1		
	9	Non-connected	
COM	8	Coder output common	0 V
	7	Non-connected	
	6		

Encoder interface card VW3-A66203 (continued)

J32 Terminal	Function	Specifications
LI9 LI10 LI11	Non-configured (ex-works)	3 logic inputs with 3.5 khom impedance 24V power supply (11V min., 30V max.) state 0 when V < 5V, state 1 when V ≥ 11V
+ 24 (1)	Logic input power supply	(20V min., 30V max.), 200 mA current flow
LOP	Logic output power supply	To be connected to the + 24V line of the internal power supply unit or external power source
LO3 LO4	Thermal level Frequency level	
COM	Logic I / O common	0 V

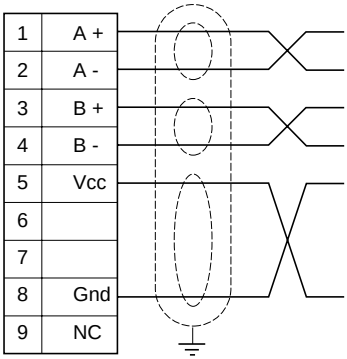
(1) The 200 mA maximum current flow corresponds to the current consumption on the + 24 V line of the control board and on the + 24 V line of flux vector control board.

It is necessary to ensure that the ground common mode voltage applied to the J32 and J13-12 terminals doesn't exceed the Extra Low Voltage (50 V AC or 120 V DC)

Encoder détermination : maximum number of pulses per mechanical revolution.

Np : maximum number of pulses per mechanical revolution,
Fs : maximum motor frequency,
p : number of pair poles,
Fmaxi by chanel = Np x Fs/p
- if Fs = 50 Hz, p = 2, Fmaxi = 240 kHz
  Np = 9600 pulses/revolution
- if Fs = 200 Hz, p = 1, Fmaxi = 240 kHz
  Np = 1200 pulses/revolution

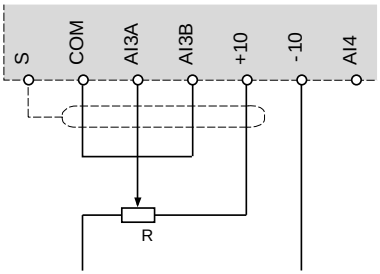
Encoder connector pin arrangement (J34) :



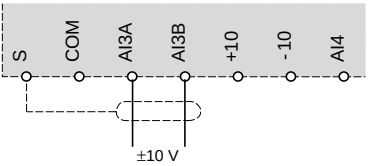
ENGLISH

Encoder interface card VW3-A66203
Terminal J 33

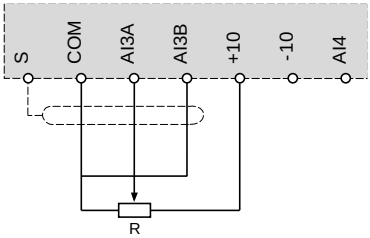
Bipolar speed reference



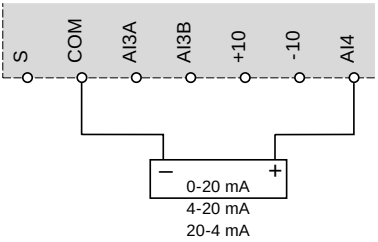
Bipolar speed reference
with ± 10V external power supply



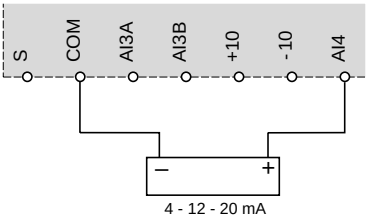
Unipolar speed reference



Current speed reference



Current torque reference



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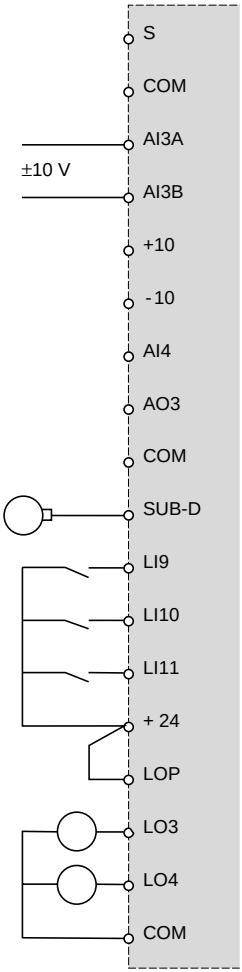
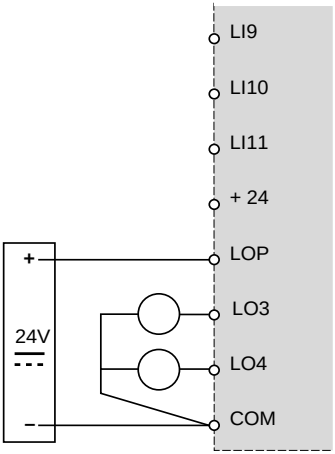
Encoder interface card VW3-A66203



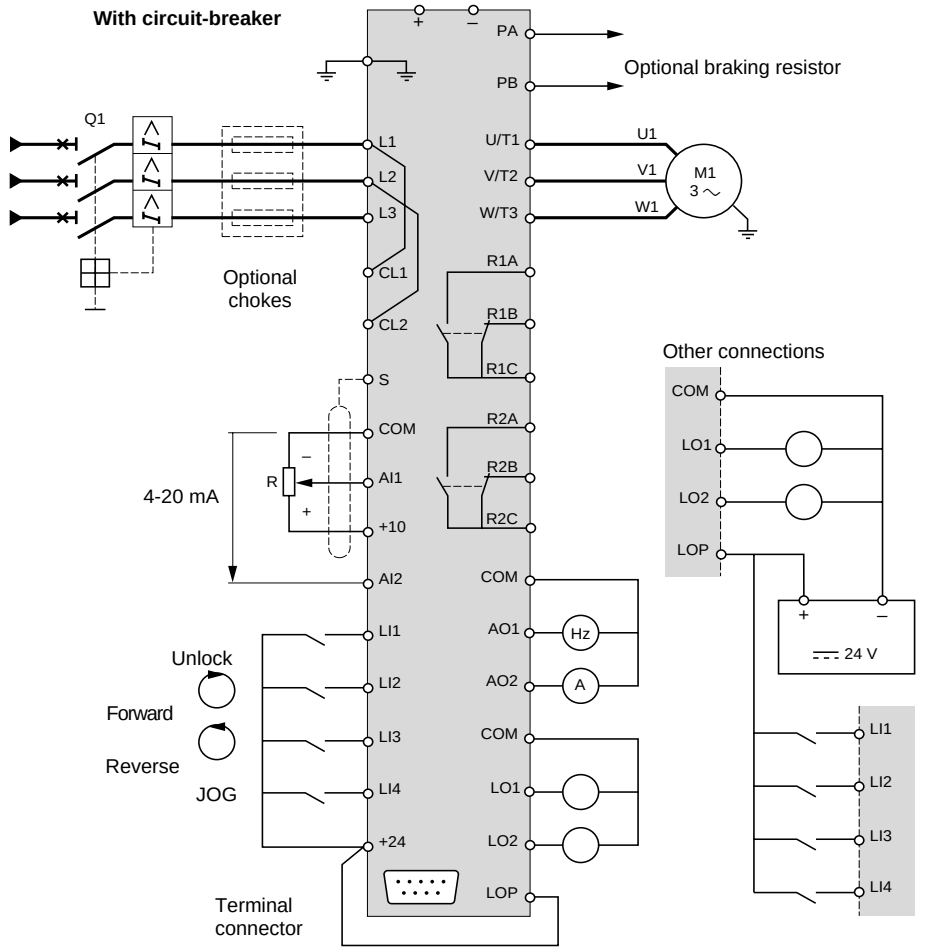
With connection to a 24Vdc external power source



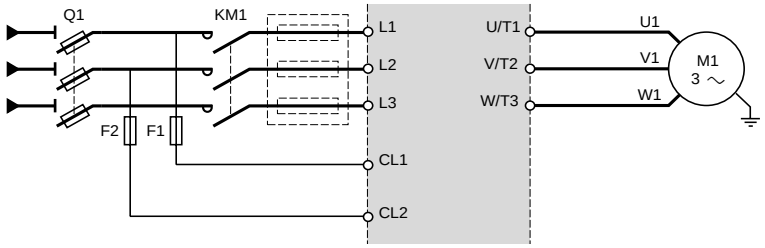
Wiring precautions

Separate the control lines from the power cables.
For the speed set-point lines, the use of a cable twisted at a pitch of 25-50 mm, or a screened cable with the screen connected to terminal S is recommended.

Connection diagrams



With contactor



Access to terminals CL1-CL2 : remove the 2 straps.When load power supply L1-L2-L3) is present or when supplied by the DC bus (+, -), power supply CL1-CL2 must always be present.

Wiring precautions

Power

Respect the cable cross-sections recommended by the standards.
Speed controller-motor connection cables :
– minimum length : 0.5 m,
– maximum length 100 m with non-screened cables, or 50 m with screened cables.
Above this, install an L or LC filter between the speed controller and the motor (refer to the catalogue).

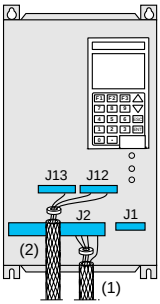
The speed controller must be connected to earth (ground), in order to conform with the regulations covering high leakage currents (above 3.5 mA). Use of a differential circuit-breaker upstream is not recommended since DC components could be generated by leakage currents from the speed controller. If the installation comprises several speed controllers on the same line, connect each controller to earth separately. If necessary, install a line choke (refer to the catalogue).

Keep the power cables separate from the low level signal circuits in the installation (detectors, PLCs, measuring apparatus, video, telephone).

Control

Keep the control circuits separate from the power cables. For the speed reference circuits, it is recommended that twisted cable with a pitch of between 25 and 50 mm is used, or screened cable with the screening connected to terminal S.

Ferrite core installation



The options to enable compliance with the EMC directive are those indicated in our documentation (EMC Catalogue No. 75011). These items need to be ordered separately.
The only items delivered with the product are :
– The control cable ferrite (blue) : "control ferrite core".
– The motor cable ferrite (red) : "motor ferrite core".

(1) motor cable
(2) control cable

The ferrites must be installed on the unscreened cable as close as possible to the terminals on the Altivar.

Please note : Schneider organisation is at your disposal to provide any assistance required in terms of Documentation, Practical Advice, Technical Assistance, EMC Traning Courses.

Selection of associated components

Circuit-breaker or isolator Q1 (with gl type fuses) : determine according to the line current, plus the consumption of the other parts of the device.

Contactor KM1 : select for category AC-1, according to the line current.

Fuses F1-F2 : determine according to the AC supply voltage and the rating of the control and ventilation power supply transformer (terminals CL1-CL2) :

– ATV-66FU41N4 to FD23N4	(sizes 1 to 3)	: 40 VA,
– ATV-66FD33N4 to FD79N4	(sizes 4 and 5)	: 110 VA,
– ATV-66FC10N4 to FC19N4	(size 6)	: 630 VA,
– ATV-66FC23N4 to FC31N4	(size 7)	: 1000 VA.

ENGLISH

Reassignment of I/O

The following I/O can be reassigned via the graphic terminal : logic inputs LI3 and LI4 or LI9 to LI11 logic outputs LO1 to LO4, relay output R2, and analog outputs AO1 and AO2.

The characteristics of current input AI2, AI4 and analog outputs AO1 to AO3 can also be modified using the graphic terminal :

– input AI2 : 4-20 mA, 0-20 mA, 20-4 mA, X-20 mA (X programmable : resolution 0.1 mA),
– input AI4 : 4-20 mA, 0-20 mA, 20-4 mA, 4-12-20 mA,
– outputs AO1 and AO2 : 0-20 mA or 4-20 mA.
– output AO3 : 4-20 mA, 0-20 mA, 4-12-20 mA.

This is described in more detail in the Programming Manual.

A switch on the control card (to the left of terminal block J13) is used to convert input AI2 to a 0-5 V reference input (after having configured it as 0-20 mA via the graphic terminal).

Minimum braking resistance values

Using a lower resistance value than the one given in the table below will cause the resistance thermal protection to become inefficient. Use preferably the values given in the catalogue.

Reference	Min. value (Ω)	Reference	Min. value (Ω)
ATV-66FU41N4	56	ATV-66FD64N4	5
ATV-66FU54N4	56	ATV-66FD79N4	5
ATV-66FU72N4	56	ATV-66FC10N4	2,5
ATV-66FU90N4	54	ATV-66FC13N4	2,5
ATV-66FD12N4	50	ATV-66FC15N4	2,5
ATV-66FD16N4	27	ATV-66FC19N4	2,5
ATV-66FD23N4	27	ATV-66FC23N4	2
ATV-66FD33N4	14	ATV-66FC28N4	1,25
ATV-66FD46N4	14	ATV-66FC31N4	1,25
ATV-66FD54N4	10		

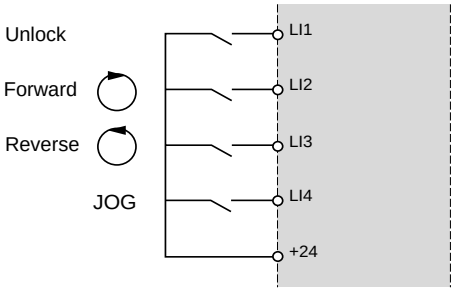
2-wire command

2-wire command : logic states maintained (factory setting for the speed controller).

2-wire command

Input LI1 :

– change to state 1 : controller unlocked,
– change to state 0 : speed controller locked and "freewheel" stop of motor.



To stop the motor following the deceleration ramp, inhibit the direction command on the enabled input LI2 or LI3.

Step by step function (JOG) : enable input LI4 before unlocking using input LI1, apply pulses to input LI2 or LI3 (direction of operation).

– the first direction command selected takes priority over the other,
– if the two direction commands are enabled simultaneously, forward operation takes priority.

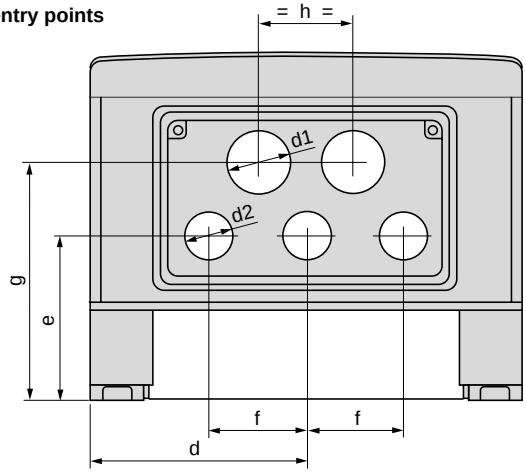
ENGLISH

Power cables to terminals L1-L2-L3 and U/T1-V/T2-W/T3

Altivar reference	Cable cross-section recommended by IEC 947-1 standards mm^2
ATV-66FU41N4	2,5
ATV-66FU54N4	2,5
ATV-66FU72N4	2,5
ATV-66FU90N4	4
ATV-66FD12N4	6
ATV-66FD16N4	6
ATV-66FD23N4	10
ATV-66FD33N4	25
ATV-66FD46N4	35
ATV-66FD54N4	35
ATV-66FD64N4	50
ATV-66FD79N4	50
ATV-66FC10N4	95
ATV-66FC13N4	120
ATV-66FC15N4	185
ATV-66FC19N4	185
ATV-66FC23N4	150 x 2 (2 cables)
ATV-66FC28N4	185 x 2 (2 cables)
ATV-66FC31N4	185 x 2 (2 cables)

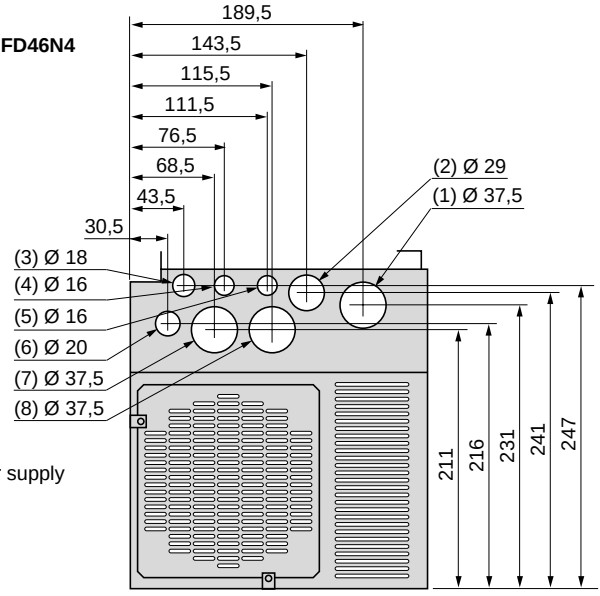
View from below showing cable entry points

Sizes 1 to 3



Size	Altivar reference	d1	d2	d	e	f	g	h
1	**ATV-66FU41N4 to FU72N4**	29	22	100	79	45	113	43
2	**ATV-66FU90N4 & FD12N4**	29	29	117	106	58	134	58
3	**ATV-66FD16N4 & FD23N4**	29	29	117	147	58	175	58

Size 4 ATV-66FD33N4 & FD46N4

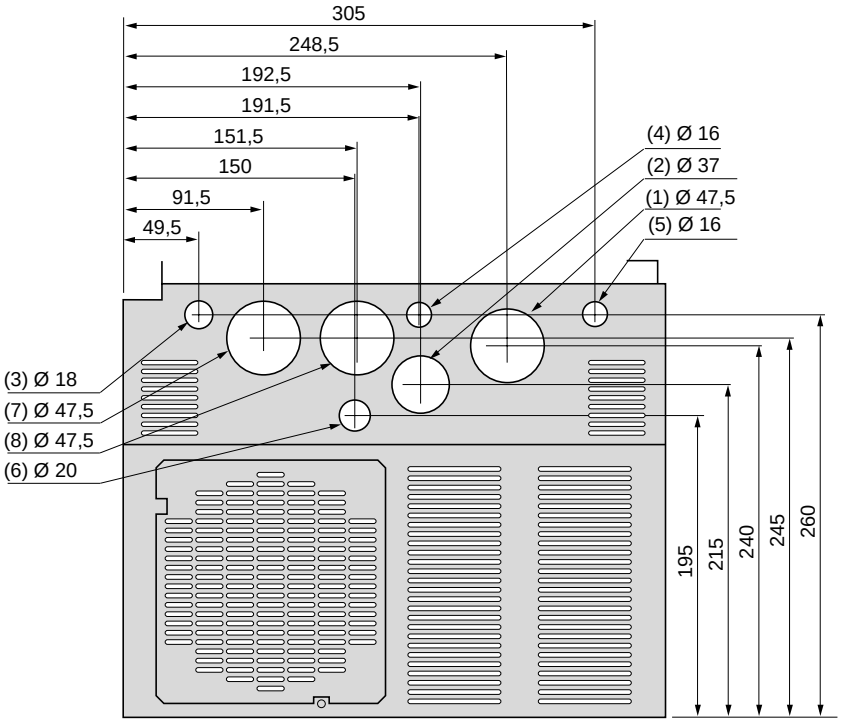


1 - Motor output
2 - PA / PB output
3 - Separate control power supply
4 - Option board
5 - Monitoring control
6 - Relay output
7 - Power supply
8 - + / - output

ENGLISH

View from below showing cable entry points

Size 5 : ATV-66FD54N4 to FD79N4

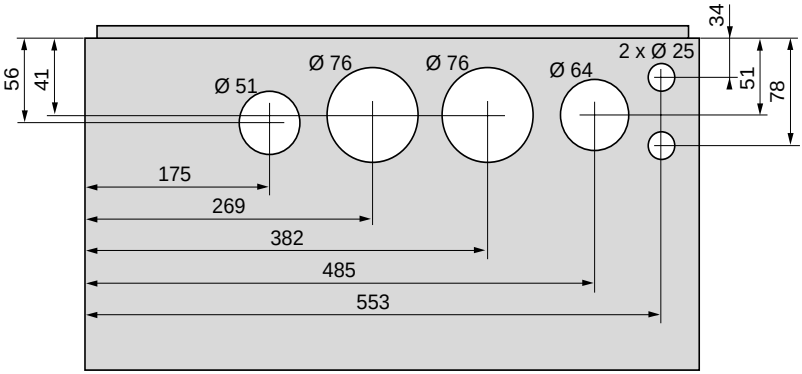


1 - Motor output
2 - PA / PB output
3 - Separate control power supply
4 - Option board
5 - Monitoring control
6 - Relay output
7 - Power supply
8 - + / - output

Cable entry points

View from below showing cable entry points

Size 6 : ATV-66FC10N4 to FC19N4



ENGLISH

Signalling on the Altivar front panel

Red LED on : Altivar faulty

Yellow LED on : Altivar current limited or in ramp automatic adaptation

Green LED on : Altivar powered up (voltage at terminals CL1-CL2)

Yellow LED flashing : thermal early warning indicating speed controller and motor overheated (ATV-66FD16N4 to FC31N4). Locks at the fault 1 minute later if the overheating persists.

Display mode on the graphic terminal screen

Display of the factory set frequency reference, or of a fault.

Display mode can be modified via the graphic terminal : see the Programming Manual.

Maintenance

Before performing any operation on the speed controller, **switch off the power supply and wait for the capacitors to discharge** (approximately 1 minute) : the red LED inside the speed controller (visible when the protective cover is removed) goes off.

The DC voltage at terminals + and – or PA and PB may reach 800 to 900 V depending on the supply voltage.

In the event of a problem during start-up or operation, check first that the recommendations relating to the environment, mounting and connection have been respected.

Servicing

The Altivar 66 does not require any preventive servicing.
It is however advisable to perform the following at regular intervals :

– check the state and tightness of connections,
– check that the temperature around the device remains at an acceptable level, and that the ventilation is efficient (average lifetime for fans : 3 to 5 years depending on the operating conditions),
– remove dust from the speed controller if necessary.

Maintenance assistance

The first fault detected is memorized and displayed on the graphic terminal screen if the control voltage (terminals CL1-CL2) is maintained : the speed controller locks, the red LED lights, and security relay R1 is tripped.

Clearing the fault

Switch off the power supply to the speed controller : to the power terminals in the event of a fault which can be reset, to the power and control terminals in the event of a fault which cannot be reset (see the following pages).
Find the cause of the fault in order to correct it.
Reconnect the power supply : this clears the fault if it has disappeared.

In some cases, the speed controller may restart automatically when the fault has disappeared, if this function has been programmed using the graphic terminal (see the Programming Manual).

Faults which can be reset

Fault	Probable cause	Remedial procedure
Input phase loss	– incorrect supply to controller or melting of fuses – transient fault of one phase of the AC supply (t ≥ 1 s)	– check the connection and the power fuses – reset
Undervoltage	– AC supply too low – transient voltage dip (t ≥ 200 ms) – load resistor damaged	– check the voltage or the motor parameter Un via the graphic terminal – reset – change the resistor
AC-line overvoltage	– AC supply too high	– check the voltage or the motor parameter Un via the graphic terminal
Drive overtemperature	– heatsink temperature too high	– check the motor load, the speed controller ventilation and the environment, and wait for the controller to cool before resetting
Motor overload	– thermal tripping caused by prolonged overload	– check the adjustment of the thermal protection via the graphic terminal, check the motor load – can be reset after approximately 7 minutes
DC-bus overvoltage	– excessive braking or driving load	– increase the deceleration time via the graphic terminal, add a braking resistor if necessary
Output phase loss	– fault on one phase at speed controller output	– check the motor connections
Loss follower	– loss of the 4-20 mA reference on input AI2	– check the connection of the reference circuits
Serial link fault (manual acceptance)	– communication fault via the serial link	– check the connection of the graphic terminal to the speed controller – check the connection of the communication option and of the PLC – check the compatibility with the communication option
Overspeed	– motor control loss	– excessively high motor load

Faults which cannot be reset

Fault	Probable cause	Remedial procedure
Short-circuit Ground fault	– short-circuit or earthing (grounding) at speed controller output	– check the connection cables (with the speed controller disconnected) and the motor insulation, check the speed controller using the graphic terminal in diagnostic mode
Precharge failure	– control fault in the capacitor charging relay – load resistor damaged	– check the connections in the speed controller and the load resistor
Internal fault	– internal fault – connection fault	– check the speed controller using the graphic terminal in diagnostic mode – check the connections in the speed controller
Memory failure	– memory error in EEPROM	– return to factory settings or client settings using the graphic terminal
Transistor short-circuit Open transistor Dynamic brake fault (fault detected if braking resistor present)	– transistor fault detected by the automatic self-test each time the speed controller is powered up	– check the speed controller using the graphic terminal in diagnostic mode
Speed feedback loss	– coder feedback cable disconnected – optical coder fault	– check the connector – check the optical coder
Encoder card fault	– bad fixing – incompatible card	– check the mounting of the card and the connector – check the release of the card

Other faults may appear if they have been programmed using the graphic terminal (see the Programming Manual).

Separate spare parts

Description	For speed controllers	Reference
Programming graphic terminal	ATV-66F all sizes	**VW3-A66206**
Control terminal blocks (plug-in parts of terminal blocks J1 - J12 - J13)	ATV-66F all sizes	**VZ3-N006**
“Controle” card (with isolating basket)	ATV-66FU41N4 to FD79N4	**VX4-A66F1**
	ATV-66FC10N4 to FC19N4	**VX4-A66F2**
Encoder interface card	ATV-66F all sizes	**VW3-A66203**
"Power" assemblies	ATV-66FU41N4	**VX5-A66U41N4**
	ATV-66FU54N4	**VX5-A66U54N4**
	ATV-66FU72N4	**VX5-A66U72N4**
	ATV-66FU90N4	**VX5-A66U90N4**
	ATV-66FD12N4	**VX5-A66D12N4**
"Power" cards	TV-66FD16N4	**VX5-A66D16N4**
	ATV-66FD23N4	**VX5-A66D23N4**
Tool for removing and inserting the power card	ATV-66FU41N4 to FD23N4	**VY1-ADV608**
"Power" cards	ATV-66FD33N4	**VX5-A66D33N4**
	ATV-66FD46N4	**VX5-A66D46N4**
	ATV-66FD54N4	**VX5-A66D54N4**
	ATV-66FD64N4	**VX5-A66D64N4**
	ATV-66FD79N4	**VX5-A66D79N4**
	ATV-66FC10N4	**VX5-A66C10N4**
	ATV-66FC13N4	**VX5-A66C13N4**
	ATV-66FC15N4	**VX5-A66C15N4**
	ATV-66FC19N4	**VX5-A66C19N4**
	ATV-66FC23N4	**VX5-A66C23N4**
	ATV-66FC28N4	**VX5-A66C28N4**
	ATV-66FC31N4	**VX5-A66C31N4**

Separate spare parts

Description	For speed controllers	Reference
"Channel control" cards	ATV-66FD16N4	**VX5-A66103**
	ATV-66FD23N4	**VX5-A66104**
	ATV-66FD33N4	**VX5-A66105**
	ATV-66FD46N4	**VX5-A66106**
	ATV-66FD54N4	**VX5-A66107**
	ATV-66FD64N4	**VX5-A66108**
	ATV-66FD79N4	**VX5-A66109**
“Filter” cards	ATV-66FD16N4 and FD23N4	**VX4-A66103**
	ATV-66FD33N4 and FD46N4	**VX4-A66104**
	ATV-66FD54N4 to FD79N4	**VX4-A66105**
	ATV-66FC10N4 to FC31N4	**VX4-A66106**
Transformers	ATV-66FD33N4 to FD79N4	**VY1-ADA604**
	ATV-66FC10N4 to FC19N4	**VY1-ADA606**
	ATV-66FC23N4 to FC31N4	**VY1-ADA607**
Current sensors (set of 2)	ATV-66FD33N4 and FD46N4	**VY1-A66104**
	ATV-66FD54N4 to FD79N4	**VY1-A66105**
Current sensors (set of 1)	ATV-66FC10N4 and FC13N4	**VY1-A66106**
	ATV-66FC15N4 and FC19N4	**VY1-A66107**
	ATV-66FC23N4 to FC31N4	**VY1-A66108**

Separate spare parts

Description	Characteristics	For speed controllers	Reference
Modules with 2 IGBT	50 A - 1200 V	ATV-66FD16N4	**VZ3-IM2050M1201**
	75 A - 1200 V	ATV-66FD23N4	**VZ3-IM2075M1201**
	100 A - 1200 V	ATV-66FD33N4	**VZ3-IM2100M1201**
	150 A - 1200 V	ATV-66FD46N4 and FD54N4	**VZ3-IM2150M1201**
	200 A - 1200 V	ATV-66FD64N4	**VZ3-IM2200M1201**
	300 A - 1200 V	ATV-66FD79N4	**VZ3-IM2300M1201**
Kits comprising :	300 A - 1200 V	ATV-66FC10N4	**VZ3-IM1300M1206**
– 2 modules with 1 IGBT	400 A - 1200 V	ATV-66FC13N4 and FC15N4	**VZ3-IM1400M1206**
– “interface” cards	500 A - 1200 V	ATV-66FC19N4	**VZ3-IM1500M1206**
Kits comprising :	400 A - 1200 V	ATV-66FC23N4 to FC28N4	**VZ3-IM1400M1207**
– 4 modules with 1 IGBT	500 A - 1200 V	ATV-66FC31N4	**VZ3-IM1500M1207**
– cards			
IGBT braking	25 A - 1000 V	ATV-66FD16N4 and FD23N4	**VZ3-IM1025M1001**
transistor modules	50 A - 1200 V	ATV-66FD33N4 and FD46N4	**VZ3-IM2050M1201**
	100 A - 1200 V	ATV-66FD54N4	**VZ3-IM2100M1201**
	150 A - 1200 V	ATV-66FD64N4 and FD79N4	**VZ3-IM2150M1201**
IGBT braking transistor	300 A - 1200 V	ATV-66FC10N4 to FC19N4	**VZ3-IM1300M1207**
and “interface” card kit	400 A - 1200 V	ATV-66FC23N4	**VZ3-IM1400M1208**
	400 A - 1200 V	ATV-66FC28N4 to FC31N4	**VZ3-IM1300M1208**
Rectifier with 6 diodes	75 A - 1600 V	ATV-66FD16N4 and FD23N4	**VZ3-DM6075M1601**
Rectifiers with 2 diodes	80 A - 1600 V	ATV-66FD33N4	**VZ3-DM2080M1606**
	100 A - 1600 V	ATV-66FD46N4	**VZ3-DM2100M1601**
	160 A - 1600 V	ATV-66FD54N4 to FD79N4	**VZ3-DM2160M1606**
Kit to 3 modules of 2 diodes	170 A - 1600 V	ATV-66FC10N4 and FC13N4	**VZ3-DM2170M1601**
	260 A - 1600 V	ATV-66FC15N4	**VZ3-DM2260M1601**
	350 A - 1600 V	ATV-66FC19N4	**VZ3-DM2350M1601**
	600 A - 1600 V	ATV-66FC23N4 to FC31N4	**VZ3-DM2600M1601**

Separate spare parts

Description	Characteristics	For speed controllers	Reference
Cooling sub-assemblies	Rate 5 dm³/s	ATV-66FU41N4 and FU54N4	**VZ3-V661**
	Rate 10 dm³/s	ATV-66FU72N4	**VZ3-V662**
	Rate 22 dm³/s	ATV-66FU90N4 and FD12N4	**VZ3-V663**
	Rate 47 dm³/s	ATV-66FD16N4 and FD23N4	**VZ3-V664**
	Rate 100 dm³/s	ATV-66FD33N4 to FD79N4	**VZ3-V665**
	Rate 250 dm³/s	ATV-66FC10N4 to FC31N4	**VZ3-V666**
Internal cooling units	Rate 11 dm³/s	ATV-66FD33N4 and FD46N4	**VZ3-V6654**
	Rate 14 dm³/s	ATV-66FD54N4 to FD79N4	**VZ3-V6655**
	Rate 14 dm³/s	ATV-66FC10N4 to FC19N4	**VZ3-V667**
	Rate 18 dm³/s	ATV-66FC23N4 to FC31N4	**VZ3-V669**
Load resistors	33 Ω - 8,5 W	ATV-66FD16N4 and FD23N4	**VZ3-R033W009**
	10 Ω - 25 W	ATV-66FD33N4 and FD46N4	**VZ3-R010W025**
	10 Ω - 480 W	ATV-66FD54N4 to FD79N4	**VZ3-R010W481**
	10 Ω - 270 W	ATV-66FC10N4 to FC31N4	**VZ3-R010W270**
Control fuse	5 A- 600(8,5 x 31,5)	ATV-66FC10N4 to FC31N4	**DF3-CF00501**
DC bus protection fuses	400 A - 700 V	ATV-66FC10N4 and FC13N4	**VY1-ADF400V700**
	450 A - 700 V	ATV-66FC15N4 and FC19N4	**VY1-ADF450V700**
		ATV-66FC23N4 and FC31N4	**VY1-ADF400V700**
Capacitors		ATV-66FD16N4 and FD23N4	**VY1-ADC152V450**
		ATV-66FD33N4 and FD46N4	**VY1-ADC472V450**
Capacitor sub-assemblies		ATV-66FD54N4	**VY1-ADC605**
		ATV-66FD64N4 and FD79N4	**VY1-ADC606**
		ATV-66FC10N4 to FC19N4	**VY1-ADC607**
		ATV-66FC23N4 to FC31N4	**VY1-ADC608**
Discharge resistors	5 kΩ - 40 W	ATV-66FD33N4 to FD79N4	**VZ3-R5K0W040**
	640 Ω - 135 W	ATV-66FC10N4 to FC19N4	**VZ3-R640W135**
	1,2 kΩ - 480 W	ATV-66FC23N4 to FC31N4	**VZ3-R1K2W480**
Temperature sensor kit		ATV-66FC10N4 to FC19N4	**VZ3-G003**
		ATV-66FC23N4 to FC31N4	**VZ3-G004**
Contactor		ATV-66FC10N4 to FC13N4	**VY1-A661C1010**
		ATV-66FC15N4 and FC19N4	**VY1-A661C1510**
		ATV-66FC23N4 to FC31N4	**VY1-A661C2310**
Auxiliary contact		ATV-66FC10N4 to FC31N4	**LA1-DN04**
Circuit breaker		ATV-66C10N4 to C31N4	**GV2M10**

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